Recognition Awards for the Integration of Research and Education

Final Report of the Operations Working Group

As specified in its July 1996 charge from the Senior Management Integration Group (SMIG), the Operations Working Group for the Recognition Awards for the Integration of Research and Education (OWG) submits this final report. The report transmits the lessons learned regarding the integration of research and education, and recommendations for next steps in the NSF's continuing efforts to implement this core strategy.

LESSONS LEARNED

Based on the review of applications for Recognition Awards, the Operations Working Group identified three major lessons. These lessons may provide a knowledge basis on which future actions can be based as NSF seeks new ways to promote the integration of research and education.

A. There are many facets and effective approaches to the integration of research and education. The Recognition Award recipients have established a variety of approaches to the integration of research and education that may be instructive in NSF's planning process. During the Recognition Award review process, the difficulty of providing a research experience to all undergraduates at institutions other than smaller schools became apparent. Successful applicants have used several approaches to providing research experiences to a larger portion of their students:

- Start with Honors Program
- Start with at-risk students
- Start with pre-service teachers

Most of the successful applicants have also created complements or alternatives to undergraduate research experiences, such as:

- living/learning/research arrangements
- course-based group research projects
- inquiry-driven laboratory courses
- seminars on faculty research
- work-study programs
- problem-based instruction
- interactive simulations of experiments on the Web

To varying degrees, successful applicants have begun the process of changing faculty culture:

- changes in hiring/promotion/tenure guidelines
- centers for improving faculty instruction
- preparation/mentoring of future faculty while they are graduate students

Reviewers identified a limited number of very promising approaches in what, for other reasons, became unsuccessful applications. Reviewers urged NSF to explore and consider the following approaches:

- graduate students can propose innovative undergraduate courses
- connecting research faculty with community college faculty
- research apprenticeships for minority students at community colleges
- mentoring programs for at-risk students involving faculty research
- uniform teaching loads for all faculty members
- a council that develops science and technology courses for non-science majors
- changing campus policies on intellectual property rights to attract industrial sponsors for student research projects
- course-based interdisciplinary group research projects that focus on community-based problems such as homelessness
- a cross-departmental structure that promotes interdisciplinary group research using the regional environment as a laboratory.

B. Integrating research and education contributes to identifiable and worthwhile results. Recognition Award recipients had all identified specific desired outcomes, had generated support among faculty for these outcomes, and had created systems for monitoring their success in generating these outcomes. Some examples from the successful applicants are:

- Increased percentage of student and faculty participation in joint research
- Increased diversity among science and engineering students
- Increased student recruitment and persistence in science majors
- Increased content knowledge and teaching skills of future K-12 teachers
- Increased content knowledge and understanding of science among non-science majors
- Increased percentage continuing to graduate school

C. Institutional leadership involves creating and supporting permanent

administrative structures that promote the integration of research and education. Recipient institutions of the Recognition Awards all had created administrative structures to promote and support various aspects of the integration of research and education. The leadership of these universities had valued the integration of research and education so highly that they committed administrative resources to this function, such as:

- undergraduate research offices that matched students to faculty mentors and provided competitive grants for student research projects
- centers for courseware development, faculty teaching improvement, and curriculum revision
- standing committees to promote excellence and innovation in teaching as part of promotion and tenure decisions
- programs to train graduate students headed for academic careers to use inquiry-based methods and to supervise student research
- interdisciplinary and cross-organizational structures that brought education faculty and faculty from other disciplines together to exchange knowledge and to design courses for future K-12 teachers

These administrative structures represent natural allies in NSF's efforts to promote the integration of research and education. At those institutions with established administrative structures, NSF may be able to leverage its support more effectively by offering larger, longer duration awards to the cognizant administrative office. NSF could also encourage and enable more institutions to create on-campus administrative structures for the integration of research and education.